

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

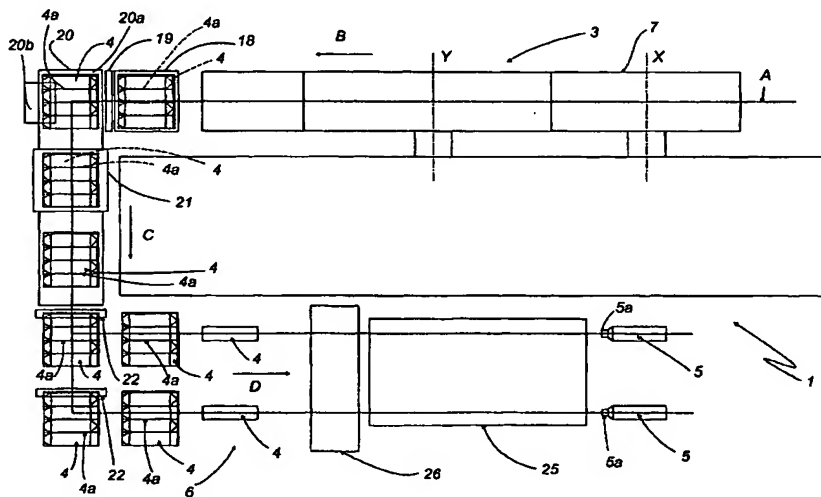
(19) World Intellectual Property  
Organization  
International Bureau(43) International Publication Date  
5 February 2004 (05.02.2004)

PCT

(10) International Publication Number  
**WO 2004/011237 A2**

- (51) International Patent Classification<sup>7</sup>: **B31B 1/16, 3/00**
- (21) International Application Number:  
PCT/IB2003/003205
- (22) International Filing Date: 14 July 2003 (14.07.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
BO2002A 000484 25 July 2002 (25.07.2002) IT
- (71) Applicant (*for all designated States except US*):  
**AZIONARIA COSTRUZIONI MACCHINE [IT/IT];**  
**AUTOMATICHE A.C.M.A. S.p.A., Via Cristoforo**  
**Colombo, 1, I-40131 Bologna (IT).**
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): **BOLDRINI, Fulvio [IT/IT]; Via Zerbini, 11, I-44100 Ferrara (IT).**  
**GHIOTTI, Roberto [IT/IT]; Via Togliatti, 4, I-40050**  
**Calderino di Monte San Pietro (IT). CAVALLARI, Stefano [IT/IT]; Via del Meloncello, 5, I-40135 Bologna (IT).**
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— *without international search report and to be republished upon receipt of that report*
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: A SYSTEM AND A METHOD FOR MANUFACTURING CONTAINERS, IN PARTICULAR FOR PRESERVING FOOD PRODUCTS



(57) Abstract: A system (1) for manufacturing containers (5) is designed around a supporting structure (2) with which all the stations (7, 18, 19, 21, 24, 25) and the devices (14, 15, 16, 17, 20, 22, 26) needed to produce the containers are associated. The system (1) is equipped with a feed station (7) supplying a forming material (9), a scoring station (18) by which crease lines (4a) are generated, and a cutting station (19), combining to prepare a succession of blanks (4). The system (1) also includes a prefolding station (21) where each blank (4) is bent initially along the creases lines (4a), a folding station (24) where the single blank (4) is fashioned to the shape of the container (5), and a sealing or welding station (26) at which the shape of the container (5) is fixed definitively.

Description

A system and a method for manufacturing containers,  
in particular for preserving food products

Technical Field

The present invention relates to a system for the manufacture of containers, in particular for preserving food products, of which the characterizing features are as recited in claim 1 appended.

5 The invention relates also to a method of manufacturing containers, in particular for preserving food products, of which the essential features are as recited in the preamble of claim 30 appended.

Background Art

10 More particularly, the invention finds application in the art field concerned with the manufacture of containers such as bottles and cartons and the like, having a structure fashioned from multilayer or coated paper material and utilized for packaging  
15 liquid foods or edible products in general, typically milk, fruit juices, yoghurt, mineral water and other such substances.

It is common practice for containers of the type in question to be manufactured on a system consisting  
20 in a number of separate machines by which a selected

REPLACED BY  
ART 34 AMDT

forming material can be fashioned into a succession of single containers or bottles ready for filling.

5 The forming material is processed generally by machines that need to be equipped with respective storage units, so that the material emerging from a given machine can be held temporarily before being transferred to the machine on which the next step of the manufacturing process will be performed.

10 The need to provide a succession of storage units is dictated by the appreciable distance that separates the various machines utilized in the container manufacturing process, and heightened by the different rates at which the forming material advances when transferred from one machine to another. Indeed the strategy adopted in order to be  
15 certain that each machine will receive a steady supply of material is to ensure that the relative storage units, positioned normally upstream and downstream of the machines, are maintained as a rule at full capacity in order to avoid repeated stoppages  
20 that would otherwise be caused by a lack of material on the infeed side.

It will be appreciated also that the manoeuvres involved in transferring the forming material from  
25 one machine to another are performed typically by one or more operators, whose main task is precisely that of minding the storage units.

Notwithstanding the merits of the container manufacturing process outlined above, which affords  
30 considerable output potential, there are certain

drawbacks attached, principally regarding the overall dimensions and the cost of the manufacturing system, also the speed with which the containers are turned out and the continuity of the process generally.

5 More exactly, the presence of a succession of machines separated one from another with relative storage units located between one machine and the next dictates that a large area is needed solely in order to accommodate the system and its minimum  
10 operating space, that is to say the space needed to ensure optimum movement of the parts associated with each machine and the material transferred from one machine to the next, and the space in which the operators employed to oversee the running of the  
15 process can carry out their various tasks.

Naturally, the system described above is typified by notably high commissioning and operating costs, in view both of the continuous maintenance requirements generated by a plurality of separate machines, and of  
20 the space needed to accommodate them.

Another consideration is that, by its very logistical nature, the manufacturing system outlined above does not allow operation at particularly high tempos, being subject to frequent pauses attributable  
25 to the switches between machines in operation on the one hand, in which the forming material is processed while advancing through the machine, and storage units on the other, in which the material is simply deposited for a given duration in readiness for its  
30 transfer to another machine.

The slowing down and frequent interruptions of the manufacturing process do nothing to help reduce the already high overheads, with the result that the end product is penalized by high marketing costs, and these same costs are driven up further by the need to employ operators exclusively for the purpose of transferring the forming material from one machine to another, a task that tends over time to become quite tedious.

The principal object of the present invention is to overcome the drawbacks typical of the prior art, by providing a system for the manufacture of containers, in particular containers for preserving foods, such as will incorporate all of the work stations needed to produce the selfsame containers, guaranteeing compact dimensions overall, achieving a reduction in the costs of producing and the costs of marketing the containers, while continuing to ensure optimum quality of the end product.

Another object of the invention is to speed up the processes by which the container is manufactured, and ensure their continuity.

A further object of the present invention is to automate the manufacturing process and thus relieve operators of tedious tasks like transferring the forming material from one machine to another, so that their activity can be confined to the conventional procedures of controlling, running and/or servicing the system.

Disclosure of the Invention

These objects and others besides, which will emerge more clearly from the following specification, are substantially realized in a system for manufacturing containers, in particular for preserving foods, of which the characterizing features are as recited in claim 1 appended.

In addition, the stated objects are realized according to the present invention in a method of manufacturing containers, in particular for preserving foods, of which the characterizing features are as recited in claim 30 appended.

The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

- figure 1 is a schematic illustration of a system for manufacturing containers according to the present invention, viewed in plan;
- figure 2 is a further schematic illustration of the system of figure 1, viewed in elevation;
- figure 3 shows a continuous strip of forming material with a bonding edge utilized by the system of figures 1 and 2, illustrated fragmentarily in perspective and in a first possible embodiment;
- figure 4 shows a continuous strip of forming material with a bonding edge utilized by the system of figures 1 and 2, illustrated fragmentarily in perspective and in a second possible embodiment;
- figure 5 is a sectional illustration of a container fashioned from the continuous strip of figure 3;

-figure 6 is a sectional illustration of a container fashioned from the continuous strip of figure 4.

With reference to the drawings, 1 denotes a system, in its entirety, for manufacturing containers in accordance with the present invention.

As indicated in figure 1, the system 1 comprises a supporting structure 2 and, associated with this same structure, a forming sector 3 serving to prepare at least one blank 4 from which to fashion a relative container 5, also a shaping sector 6 operating downstream of the forming sector 3, of which the function is to fold the single blanks 4 emerging from the forming sector 3 and establish the shape of the respective folded containers 5 by means of a fixing operation.

In particular, and referring to figures 1 and 2, the forming sector 3 comprises a feed station 7 by which a continuous strip 8 of forming material 9, suitable for preserving liquid food products, is directed along a predetermined feed path A. The forming material 9 will consist preferably of a multilayer or treated paper material, such as paperboard or cardboard coated with an impermeable and antiseptic film, typically polyethylene.

The aforementioned continuous strip 8 of forming material 9 is preferably carried by and decoilable from a main reel 10 of the feed station 7 rotatable about a relative longitudinal axis X.

As discernible in figure 2, the feed station 7 also comprises at least one auxiliary reel 11 rotatable

likewise about a relative longitudinal axis Y, from which a relative second strip 12 is decoiled.

The continuous strip 12 decoiled from the auxiliary reel 11 can be spliced in conventional manner to the strip 8 decoiled from the main reel 10, thereby ensuring that the system 1 is guaranteed a continuous supply of forming material 9. In practice, the two continuous strips 8 and 12 will be joined whenever the strip 8 or 12 currently in use is nearing depletion.

More exactly, the trailing end of the continuous strip 8 or 12 currently in use will be cut and spliced to the leading end of a new roll of strip 8 or 12 carried by another reel 10 or 11.

To advantage, each reel 10 or 11 is interchangeable with another reel 10 or 11, so that when the strip 8 or 12 is fully depleted, the empty reel 10 or 11 can be replaced with a full reel 10 or 11.

Still referring to figures 1 and 2, the feed station 7 also comprises a plurality of guide elements 13, consisting preferably in guide rollers, serving to establish a first leg B of the feed path followed by the forming material 9 that extends externally of the supporting structure 2 of the system 1, along a direction substantially parallel to the longitudinal dimension of the selfsame supporting structure.

The system 1 further comprises a traction device 14 operating downstream of the feed station 7, by which the strip 8 or 12 of forming material 9 is taken up



directly and drawn from the respective reel 10 or 11 over the aforementioned guide elements 13.

5 In particular, the traction device 14 comprises a pair of pinch rolls 14a positioned mutually tangential and establishing a passage 14b through which the forming material 9 is routed by the guide elements 13 of the feed station 7.

10 To ensure the correct feed motion of the forming material 9, at least one of the two pinch rolls 14a of the traction device 14 is coupled to drive means of conventional embodiment (not illustrated) and thus power driven, so that the forming material 9 located upstream of the traction device 14 will be drawn from the respective reel 10 or 11.

15 Still referring to figure 2, the system 1 can be equipped with a numbering device 15 serving to mark consecutive portions of the forming material 9 at points coinciding with the single blanks 4. The numbering device 15 operates between successive guide elements 13 of the feed station 7 in such a way as to mark the forming material 9 at a point along the feed path where the strip extends substantially in a horizontal plane.

20 The system 1 also comprises a tensioning device 16 positioned and operating upstream of the traction device 14, in such a way that the segment of the forming material 9 advancing downstream of the selfsame device 16 is tensioned longitudinally in order to facilitate certain operations carried out along the first leg B of the feed path A, typically

30

those by which the forming material 9 is creased or scored and then cut into blanks, as will be described in due course.

As indicated in figure 2, the tensioning device 16 comprises at least one pair of pinch rolls 16a positioned mutually tangential and establishing a passage 16b through which the strip of forming material 9 is routed by the guide elements 13 of the feed station 7.

In a preferred embodiment, at least one of the two pinch rolls 16a of the tensioning device 16 is subjected to a braking action when in rotation, such as will oppose the action of the traction device 14 and tension the forming material 9 longitudinally along the segment downstream of the device 16, as mentioned above.

As indicated likewise in figure 2, the system 1 can include a sterilizing device 17 operating along the first leg B of the feed path A followed by the advancing strip, of which the function is to debacterialize the forming material 9.

More exactly, the sterilizing device 17 comprises at least one ultraviolet lamp 17a directed at a substantially horizontal segment of the forming material 9 extending between the tensioning device 16 and the traction device 14.

The sterilization of the forming material 9 might nonetheless be carried out employing any given method and utilizing any conventional sterilizing device. For example, the ultraviolet sterilization method

mentioned above might be replaced or supplemented by a sterilization step involving exposure of the forming material 9 to substances such as ozone and/or peroxide agents of various types.

5 Still in figure 2, the forming material 9 decoiling from the reel 10 or 11 currently in use is also subjected to the action of a finishing device 22 operating between the tensioning device 16 and the traction device 14, upstream of the sterilizing  
10 device 17. The finishing device 22 operates on a bonding edge 4b of the advancing strip 8 or 12, and serves to prepare the selfsame edge 4b in such a way that it can be positioned safely on the inside of the formed container 5.

15 The term "bonding edge" is used to indicate a free lateral edge of the advancing strip 8 or 12, hence a free longitudinal edge of each blank 4 cut from the strip, along which a sealing or welding operation is performed to establish the shape of the resulting  
20 container 5, at least in part.

In short, the bonding edge 4b constitutes a fixing portion of each blank 4 such as will combine with the main body of the blank in overlapping contact to establish a sealable or weldable area.

25 In accordance with a first embodiment of the invention (figure 3), the finishing device 22 might comprise seam-folding means (not illustrated) by which the bonding edge 4b can be bent double longitudinally along its length so that a treated  
30 portion of the forming material, having the required

properties of hygiene and impermeability, will remain on the inside of the container 5 (figure 5).

To this end, the finishing device 22 might also comprise fixing means (non illustrated) consisting preferably in one or more sealing or welding devices, such as will secure the bonding edge 4b in the folded position before the material is directed into a further processing station.

In accordance with a second embodiment of the invention (figure 4), the finishing device 22 might comprise application means (not illustrated) by which to lay a fillet 23 of treated material along the bonding edge 4b of the advancing strip 8 or 12, so that the raw edge of the material 9 will be covered by a portion of treated material having the required properties of hygiene and impermeability, positioned on the inside of the container 5 (figure 6).

As illustrated in figures 1 and 2, the forming sector 3 comprises a scoring station 18 positioned downstream of the feed station 7, and more exactly, immediately downstream of the traction device 14, by which each portion of the forming material 9 destined to provide a relative blank 4 is impressed with at least one crease line 4a.

In the example of figure 2, the scoring station 18 comprises at least one press 18a presenting mutually opposed dies 18b offered to the two faces of the forming material 9. In operation, the press 18a will alternate between an idle position in which the two dies 18b are distanced from the forming material 9

interposed between them, and an operating position in which they are brought together forcibly against the forming material 9 in such a way as to generate the crease line, or lines 4a.

5       As an alternative solution to the press 18a, the scoring station 18 might comprise at least one pair of tangentially placed rollers (not illustrated) operating from either side on the advancing strip of forming material 9. To produce the crease lines 4a, a  
10       first roller will afford one or more projections designed to indent the structure of the forming material 9, whilst a second roller or reaction roller will present grooves corresponding in number and matched positionally to the projections presented by  
15       the first roller, so that each projection engages a respective groove.

      The forming sector 3 also comprises a cutting station 19 operating downstream of the scoring station 18, by which the creased forming material 9  
20       is taken up from this same station 18 and divided into successive discrete pieces, each constituting a respective blank 4. The cutting station 19 comprises at least one blade 19a positioned to operate in close proximity to the scoring station 18 so that the  
25       forming material 9 can be cut immediately adjacent to the press 18a. In operation, like the press, the blade 19a alternates between an idle position distanced from the forming material 9, and an operating position of engagement with the selfsame  
30       material 9, in which the strip is cut transversely.

To advantage, the blade 19a can be timed to alternate between the idle position and the operating position synchronously with the movement of the press 18a of the scoring station 18 between the idle position and the operating position, so that the press 18a and the blade 19a are made to engage the forming material 9 simultaneously.

As discernible from figures 1 and 2, the forming sector 3 further comprises at least one transfer device 20 by which each blank 4 emerging from the cutting station 19 is carried toward the shaping sector 6 where it will be fashioned into a relative container 5. In the example illustrated, the transfer device 20 comprises a conveyor belt 20a, and one or more gripper elements 20b associated with the belt, such as will take up each blank 4 from the cutting station 19 and accompany it along the belt 20a.

The conveyor belt 20a will extend preferably in a direction perpendicular to the first leg B of the feed path A, establishing a second leg C extending externally of the supporting structure 2, along which the forming material 9 is directed.

At a given point on this same second leg C of the feed path A followed by the forming material 9, the system 1 is equipped with a prefolding station 21 by which blanks 4 emerging from the cutting station 19 are bent initially along the crease lines 4a made at the scoring station 18. In particular, the function of the prefolding station 21 is to bend the structure of each successive blank 4 conveyed from the cutting

station 19 toward the shaping sector 6 by applying one or more mechanical actions such as will deform the material slightly along the crease lines 4a.

5 More exactly, the step of prefolding each blank 4 is performed by one or more movable folder elements (not illustrated) operating in conjunction with a corresponding number of reaction elements (likewise not illustrated). The folder elements will force the relative portions of the blank 4, whilst the reaction  
10 elements will restrain the adjacent portions so as to weaken the structure of the blank 4 along the crease lines 4a extending between the forced and restrained portions.

As discernible in figure 1, the shaping sector 6  
15 comprises a folding station 24 operating downstream of the transfer device 20, where each blank 4 is bent along the longitudinal crease lines 4a in such a way as to take on the shape of a relative container 5, at least in part. In practice, the folding station 24  
20 will be equipped with a set of folder elements (not illustrated) designed to operate on the blanks 4 in combination with one or more reaction elements (not illustrated), for example mandrels of substantially cylindrical geometry, around which the blank 4 is  
25 wrapped in such a way as to assume a substantially tubular configuration rendered stable ultimately by fixing the bonding edge 4b to the corresponding part of the blank 4.

The shaping sector 6 further comprises a sealing or  
30 welding station 25, located downstream of the folding

station 24, at which each blank 4 acquires the definitive shape of the container being manufactured. The station 25 in question is furnished preferably with additional folder elements (not illustrated) set up to operate on one end of each tubular blank 4, by which the bottom of the container 5 is formed, and at least one sealer or welder (not illustrated) acting on portions of each container 5 that may require one or more sealed or welded joints.

In the example of figure 1, the shaping sector 6 also incorporates at least one assembly device 26 of which the function is to apply a neck 5a to one end of each tubular blank 4 emerging from the folding station 24.

The neck 5a is fixed to the tubular structure of the folded blank 4 at one end, opposite to the end functioning as the bottom of the container 5. With this purpose in view, it is preferable that the sealing or welding station 25 will include at least two units equipped with respective sealers or welders set up to engage the neck 5a, where this is attached to the main body of the blank 4, and to engage other parts of the container 5 such as the bottom.

It will also be observed that the system described thus far, which is designed to prepare blanks 4 from a continuous strip of forming material 9, might operate equally well with forming material 9 procured as a flat tube that can be scored and cut to generate a succession of blanks 4 in similar fashion to the strip forming material 9, or a material having some



other initial structural configuration. In this case, naturally enough, the system might present certain differences from the example illustrated, especially in the area of the folding station 24, where the folding steps would be replaced by an erecting step in which the blanks 4 are subjected to a lateral compressing action applied in such a way that the flat profile opens out into a tubular configuration, or in the area of the sealing/welding station 25, where the operation and structure of the sealing or welding equipment will depend exclusively on the type of procedure needed to complete the erection of the blank 4.

With reference to figure 1, the shaping sector 6 establishes a third leg D of the feed path A followed by the forming material 9, extending externally of the supporting structure 2 and substantially parallel to the first leg B, in such a way that the path A followed by the forming material 9 circumscribes the selfsame structure 2, at least in part, substantially describing a letter "C".

The system thus described might nonetheless present a substantially linear configuration when viewed in plan, with the forming and shaping sectors 3 and 6 aligned along a substantially rectilinear path. In this instance, were the shaping sector 6 to include two or more shaping lines 6a, the forming material 9 would follow a path presenting: a first rectilinear leg extending parallel to the longitudinal dimension of the supporting structure 2; a second leg extending

substantially perpendicular to the first, allowing the transfer of the forming material 9 to any one of the single shaping lines 6a, which are offset from the first leg; and a third leg parallel to the first leg, along which the forming material 9 proceeds in the same direction as followed along the first leg.

The particular layout of the system 1, presenting stations and devices all associated with the supporting structure 2 to create a single, solid and functional assembly, is characterized further by the inclusion of feed means (not illustrated) such as will ensure the forming material 9 can be transferred from one station or device to the next substantially at a predetermined and uniform tempo, thus ensuring the continuity of the manufacturing process.

The operation of the system 1, described thus far essentially in structural terms, is as follows.

With the traction device 14 activated and running, the system 1 will proceed initially to form the blanks 4, and thereafter to shape them as appropriate for the selected type of container 5. The process is a continuous one, with no breaks between the steps of forming the blanks 4 and shaping the containers 5.

In more detail, during the process of preparing the blanks 4, the forming material 9 carried by the respective reel 10 or 11 currently in use will be drawn by the traction device 14 along the first leg B of the feed path A toward the scoring station 18.

The material is engaged first by the numbering device 15, which marks the strip at regular

predetermined intervals to identify the portions that will be separated ultimately into single blanks 4.

5       Next, the forming material 9 is directed through the rolls 16a of the tensioning device 16, which presents a measure of resistance to the advancing motion of the strip, combining thus with the traction device 14 to generate a longitudinal tension that will facilitate the successive steps of scoring and cutting the material 9.

10       The advancing material 9, and more exactly the face of the material that will be positioned on the inside of the container 5, is then sterilized during the course of its passage from the tensioning device 16 toward the traction device 14.

15       In addition, and likewise as the forming material 9 is drawn from the tensioning device 16 toward the traction device 14, a finishing operation is performed to the end of preparing the bonding edge 4b that will be positioned on the inside of the relative  
20       container 5.

      In this step, more exactly, the bonding edge 4b may undergo two different types of preparation. The first consists in folding the edge double longitudinally against the face of the material 9 opposite the face  
25       that will be located ultimately on the inside of the container, then flattening and securing the fold to produce a bonding edge 4b of double thickness. The second consists in applying a fillet 23 of treated material to the bonding edge 4b along its entire  
30       length, without any fold being made.

After the finishing and sterilizing steps, the forming material 9 proceeds through the passage 14b afforded by the traction device 14 and toward the scoring station 18.

5        Once a given portion of the forming material 9, corresponding to one blank 4, is located between the dies 18b of the press 18a operating at the scoring station 18, the press 18a will be caused to move from the idle position to the operating position. The two  
10        dies 18b of the press 18a are consequently drawn together, impinging forcibly on the interposed forming material 9 and impressing it along a set of predetermined crease lines 4a.

15        After the forcing stroke, the press 18a will be deactivated and the dies 18b drawn apart to release the forming material 9, which can thus advance beyond the cutting station 19 toward the conveyor belt 20a. On reaching the conveyor belt 20a, the forming  
20        material 9 is taken up by one or more gripper elements that will facilitate the operation of cutting through the creased material 9. In effect, as the creased forming material 9 is restrained by the gripper elements 20b of the transfer device 20, the blade 19a of the cutting station 19 is caused to move  
25        from the idle position to the operating position, slicing through the material in close proximity to the scoring station 18 and separating the creased portion, now a formed blank 4, from the forming material 9 subsequently inserted between the dies 18b  
30        of the press 18a. Advantageously, the forcing stroke

of the press 18a is timed to occur simultaneously with the cutting stroke of the blade 19a, in such a way that each newly creased portion of forming material 9 is separated from the successive portion as the successive portion is creased in its turn.

5 Each blank 4 formed in this way is transferred along the second leg C of the feed path A and toward the shaping sector 6, passing through the prefolding station 21 in which the blank 4 is bent initially along the crease lines 4a.

10 The blank 4 now advances along the third leg D to the folding station 24, where it is bent along the crease lines 4a to assume the definitive shape of the selected container 5 at least in part.

15 Next, the blank 4 undergoes at least one sealing or welding operation as a result of which the shape of the selected container 5 created by bending the blank is fixed and thus made permanent. In the event of the container being fitted with a separately embodied neck 5a, this obviously will be assembled prior to the sealing or welding step and fixed permanently to the body of the container as part of this same step.

20 All of the sealing or welding steps executed as part of the method described above can be carried out using any given conventional method, which preferably would include heat-sealing, ultrasonic welding and/or induction welding.

25 The problems associated with the prior art and the stated objects are respectively overcome and realized in accordance with the present invention.

30

First and foremost, the containers manufactured by the system according to the invention are of optimum quality, both from the structural standpoint and from that of their intended use, namely preserving foods.

5 Furthermore, the system described and illustrated features a single structure incorporating all of the stations and devices needed to fashion the containers. In particular, the system 1 disclosed is characterized by notably compact dimensions, which  
10 result in a considerable saving of space that will also translate into cost savings, unlike solutions typical of the prior art which call for much larger spaces due to the appreciable distances between one station and another and the extensive use of storage  
15 units between the stations in which to hold the forming material.

In addition, the containers are turned out quickly and with no interruptions resulting from the need to transfer material from one station to another, as the  
20 material is transferred along the feed path A automatically.

It will also be appreciated that single containers are manufactured by the system 1 from start to finish, without the need for any action on the part  
25 of operators, who instead can concentrate fully on the procedures of controlling, running and/or servicing the system, which are decidedly less tedious than the repetitive tasks of transferring material from one station to another.

Claims

1) A system for manufacturing containers, in particular for preserving food products, comprising a supporting structure and characterized in that it is a system (1) composed entirely of parts associated with the supporting structure (2), namely: a forming sector (3) supplied with a continuous strip (8, 12) of forming material (9) used in the preparation of at least one blank (4) from which to fashion a respective container (5), and establishing a first leg (B) of a feed path followed by the material (9); a transfer device (20) operating downstream of the forming sector (3), serving to distance the forming material (9) from the forming sector (3) and establishing a second leg (C) of the feed path followed by the material; and a shaping sector (6) operating downstream of the forming sector (3), by which each blank (4) emerging from the sector (3) is folded and caused ultimately by means of a fixing operation to assume the shape of the container (5) produced by the folding step, the shaping sector (6) establishing a third leg (D) of the feed path followed by the forming material (9).

2) A system as in claim 1, wherein the forming sector (3) and the shaping sector (6) are arranged in line operationally, so that the path followed by the forming material (9) when advancing between the

REPLACED BY  
ART 34 AMDT

forming sector (3) and the shaping sector (6) is substantially linear.

3) A system as in claim 2, wherein the shaping sector (6) comprises at least two substantially parallel shaping lines (6a) onto which the forming material (9) emerging from the forming sector (3) is directed.

4) A system as in claim 1, wherein the first leg (B) of the feed path extends substantially parallel to the longitudinal dimension of the supporting structure (2); the second leg (C) of the feed path extends transversely to the first leg (B); and the third leg (D) of the feed path extends substantially parallel to the first leg (B) and transversely to the second leg (C).

5) A system as in claim 4, wherein the legs (B, C, D) are disposed in such a manner that the forming material (9) will follow a feed path (A) extending externally of the supporting structure (2) at least in part, and presenting substantially a letter-C configuration by which the supporting structure is circumscribed at least in part.

6) A system as in claims 1 to 5, wherein the forming sector (3) comprises: a feed station (7) supplying the forming material (9); a cutting station (19) operating downstream of the feed station (7), by



which the forming material (9) is divided into a succession of discrete lengths each constituting a respective blank (4); a scoring station (18) operating downstream of the feed station (7), by which at least one crease line (4a) is applied to  
5 each length of forming material (9) constituting a blank (4); and a preforming station (21) operating downstream of the feed station (7), by which the forming material (9) is bent initially along the  
10 crease line (4a).

7) A system as in claim 6, wherein the feed station (7) comprises at least one main supply reel (10) carrying a coiled continuous strip (8) of the forming material (9) and rotatable about a respective  
15 longitudinal axis (X) in such a way that the continuous strip (8) of forming material (9) can be decoiled.

8) A system as in claim 7, wherein the feed station (7) comprises at least one auxiliary supply reel (11) carrying a further continuous strip (12) of the  
20 forming material (9) that can be spliced to the continuous strip (8) of the main reel (10) to guarantee continuity of the supply of forming material (9), each supply reel (10, 11) being  
25 replaceable, on final depletion of the relative forming material (9), with a further reel (10, 11) carrying a fresh supply of the forming material (9).

REPLACED BY  
ART 34 AMDT.

9) A system as in claims 6 to 8, where claim 6 is dependent on claim 4 or 5, wherein the first leg (B) of the feed path (A) followed by the forming material (9) is established by a plurality of guide elements (13) constituting part of the feed station (7).

10) A system as in claims 7 to 9, further comprising a traction device (14) operating by direct interaction with the forming material (9) at a point downstream of the feed station (7) and serving to decoil the selfsame material from the relative supply reel (10, 11).

11) A system as in claim 10, wherein the traction device (14) comprises a pair of pinch rolls (14a), positioned mutually tangential and establishing a passage (14b) through which the forming material (9) is directed, including at least one roll (14a) that can be power driven in rotation to the end of advancing the forming material (9) through the passage (14b) of the device (14).

12) A system as in claim 10 or 11, further comprising at least one tensioning device (16) operating upstream of the traction device (14) and in such a manner that the segment of forming material (9) extending downstream of the selfsame device (16) is subjected to a predetermined longitudinal tension.

REPLACED BY  
ART 34 AMDT.

13) A system as in claim 12, wherein the tensioning device (16) comprises at least one pair of pinch rolls (16a), positioned mutually tangential and establishing a passage (16b) through which the forming material (9) is directed, including at least one roll (16a) subjected to a braking action when in rotation in such a way as to tension the forming material (9) advancing through passage (16b) of the device (16).

14) A system as in claims 5 to 13, comprising at least one sterilizing device (17) operating along the feed path (A) followed by the forming material (9) and serving to debacterialize the selfsame material.

15) A system as in claim 14 where dependent on claim 12, wherein the sterilizing device (17) operates on the forming material (9) at a point between the tensioning device (16) and the traction device (14).

16) A system as in claims 5 to 15, wherein the scoring station (18) is positioned to operate at a point along the feed path (A) followed by the forming material (9), between the feed station (7) and the cutting station (19).

17) A system as in claim 16, wherein the scoring station (18) comprises at least one press (18a) presenting mutually opposed dies (18b) offered to the two faces of the forming material (9), capable of

alternating between an idle position in which the dies (18b) are distanced from the forming material (9) interposed between them, and an operating position in which they are brought together forcibly against the forming material (9) in such a way as to generate the crease line (4a).

18) A system as in claim 17, wherein the cutting station (19) comprises at least one blade (19a) positioned to operate in close proximity to the scoring station (18) in such a way that the forming material (9) can be cut immediately adjacent to the press (18a), capable of alternating between an idle position distanced from the forming material (9), and an operating position of engagement with the selfsame material (9), in which a blank (4) is separated.

19) A system as in claim 18, wherein the blade (19a) of the cutting station (19) can be timed to alternate between the idle position and the operating position synchronously with the movement of the press (18a) of the scoring station (18) between the relative idle position and operating position, in such a manner that the press (18a) of the scoring station (18) and the blade (19a) of the cutting station (19) are made to engage the advancing forming material (9) simultaneously.

20) A system as in claims 4 to 19, wherein the transfer device (20) comprises at least one gripper

element (20b) serving to take up each blank (4) of forming material (9) released from the cutting station (19), and capable of movement along the second leg (C) of the feed path between the cutting station (19) and the shaping sector (6) to the end of advancing each successive blank (4).

21) A system as in claims 6 to 20, wherein the prefolding station (21) operates at a point on the second leg (C) of the feed path downstream of the cutting station (19), in such a manner as to initiate a bend in the length of forming material (9) constituting each blank (4) along the relative crease line (4a) generated by the scoring station (18).

22) A system as in claims 5 to 21, further comprising a finishing device (22) associated with the feed station (7) and designed to operate on at least one bonding edge (4b) of the advancing forming material (9) in such a way that the bonding edge of the single blank (4) is rendered suitable for positioning on the inside of the relative container (5).

23) A system as in claim 22 where dependent on claim 12, wherein the finishing device (22) operates between the tensioning device (16) and the traction device (14).

24) A system as in claim 22 or 23, wherein the finishing device (22) comprises: seam-folding means

by which the bonding edge (4b) is bent double along its length in such a way that the bonding edge (4b) of each blank will present a treated portion directed toward the inside of the relative container (5); also  
5 fixing means by which to secure the bonding edge (4b) in the bent configuration.

25) A system as in claim 22 or 23, wherein the finishing device (22) comprises application means by which to lay a fillet of treated material (23) over  
10 the raw edge of the advancing material (9), so that the bonding edge (4b) of each blank will be covered by a layer of material suitable for positioning on the inside of the relative container (5).

26) A system as in claims 1 to 21, wherein the  
15 shaping sector (6) comprises: a folding station (24) at which each blank (4) is bent along the crease lines (4a) in such a way as to take on the shape of the container (5) being manufactured, and a sealing or welding station (25) located downstream of the  
20 folding station (24), where each blank (4) is secured in the configuration presented on emerging from the folding station (24) to assume the definitive shape of the relative container (5).

27) A system as in claim 26, wherein the sealing or  
25 welding station (25) comprises at least one sealer or welder such as will fix each blank (4) in the

definitive configuration of the manufactured container (5).

28) A system as in claim 26 or 27, further comprising an assembly station (26) operating between the folding station (24) and the sealing or welding station (25) and serving to apply at least one neck (5a) to each folded blank (4) emerging from the folding station (24), wherein each neck (5a) is fixed to the folded blank (4) at the sealing or welding station (25) through the agency of the sealer or welder.

29) A system as in claims 4 to 28, further comprising feed means associated with the supporting structure (2) and serving to guarantee the movement of the forming material (9) between the stations (7, 18, 19, 21, 24, 25) of the system (1), wherein such means comprise the transfer device (20) and cause the forming material (9) to pass from one station (7, 18, 19, 21, 24, 25) to the next substantially at a predetermined and uniform tempo.

30) A method of manufacturing containers, in particular for preserving food products, comprising the steps of: forming a succession of blanks (4) from which to fashion respective containers (5), by dividing a continuous strip (8, 12) of forming material (9) into discrete lengths; shaping each blank (4) obtained by way of the forming step, in

REPLACED BY  
ART 34 AMDT

such a way as to assume a definitive and permanent configuration, characterized in that the steps of forming the blanks (4) and shaping the containers (5) are implemented continuously on a single system (1),  
5 without any break in continuity between the forming step and the shaping step.

31) A method as in claim 30, wherein the step of forming the blanks (4) comprises the single steps of: causing a continuous strip (8, 12) of forming  
10 material (9) to advance along a feed path; scoring the forming material (9) along at least one crease line (4a) occupying a portion of the material (9) that will ultimately provide a blank (4); cutting the continuous strip (8, 12) of the forming material (9)  
15 to separate at least one discrete length constituting a blank (4); bending the forming material (9) of each blank (4) along the crease lines (4a).

32) A method as in claim 31, wherein the steps of scoring and of cutting the forming material (9) are  
20 implemented simultaneously.

33) A method as in claim 31, wherein the step of folding the forming material (9) of each blank (4) is implemented after the scoring and cutting steps.

34) A method as in claim 31, further comprising a  
25 finishing step, preceding the scoring step, by which at least one bonding edge (4b) of the continuous

**REPLACED BY  
ART 34 AMDT.**



strip of forming material (9) is prepared in such a way as will render it suitable for positioning on the inside of the relative container (5).

5 35) A method as in claim 34, wherein the step of preparing the bonding edge (4b) comprises the single steps of: folding the edge (4b) double longitudinally against the face of the material (9) opposite the face that will be located ultimately on the inside of the container (5), to produce two thicknesses of  
10 material breasted fully in contact; securing the two thicknesses of folded material permanently together so that the external surfaces of the double folded bonding edge (4b) will be offered ultimately to the inside of the container (5).

15 36) A method as in claim 34, wherein the step of preparing the bonding edge (4b) comprises the step of applying at least one fillet (23) of treated material to the raw edge of the forming material (9) along its full length, so that the bonding edge (4b) will be  
20 covered entirely by a portion of material suitable for positioning on the inside of the relative container (5).

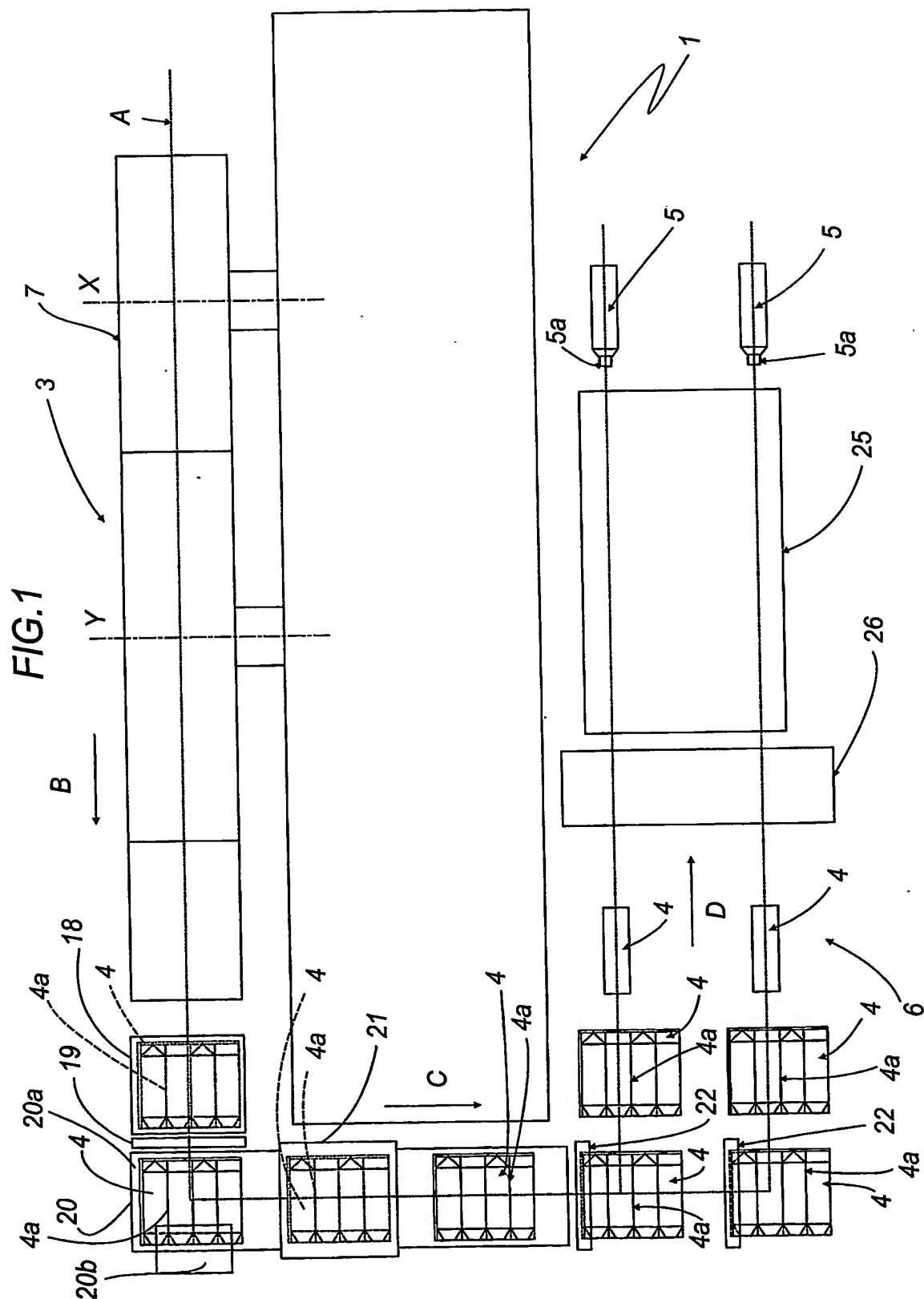
25 37) A method as in claims 30 to 36, wherein the step of shaping each blank (4) to produce a respective container (5) comprises the single steps of: bending the blank (4) further along the crease line (4a) to obtain the definitive shape of the container (5);

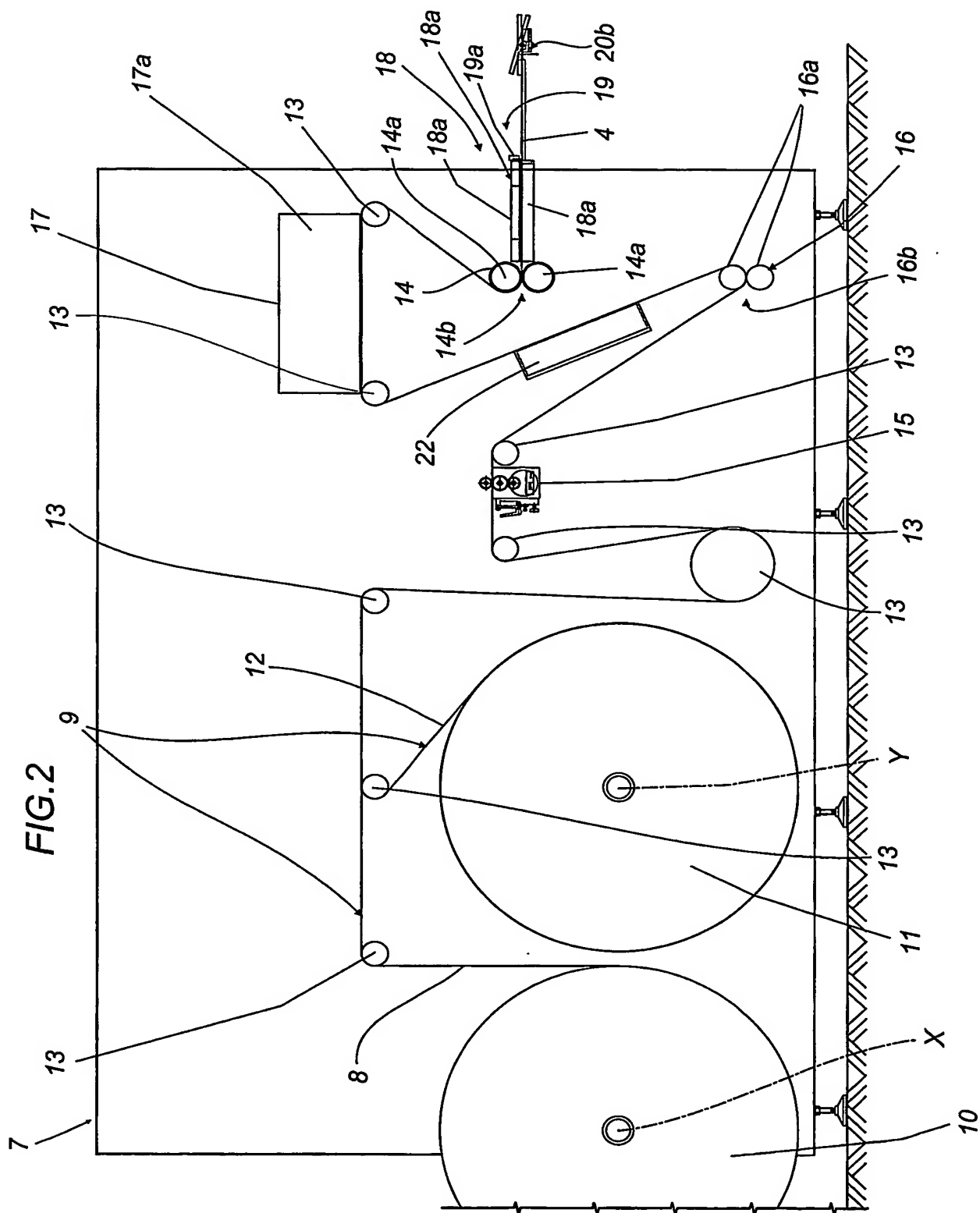
fixing each blank (4) in the configuration produced by the further bending step.

38) A method as in claims 30 to 37, further comprising at least one step of sterilizing the forming material (9) advancing along the feed path.

39) A method as in claims 30 to 38, wherein the forming material (9) is caused to advance at a predetermined rate of feed in such a way that different processing steps will be performed on the selfsame material (9) substantially at the same tempo.

REPLACED BY  
ART 34 AMDT





3/4

FIG.3

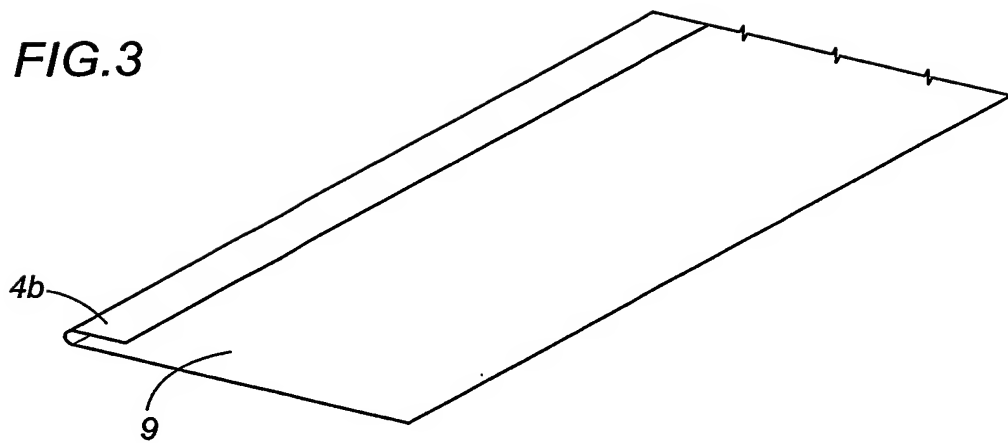
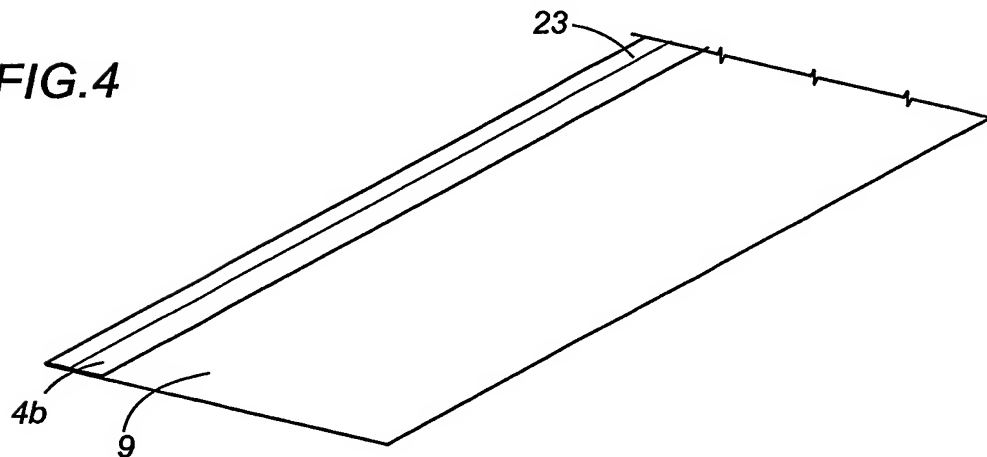


FIG.4



4/4

FIG.5

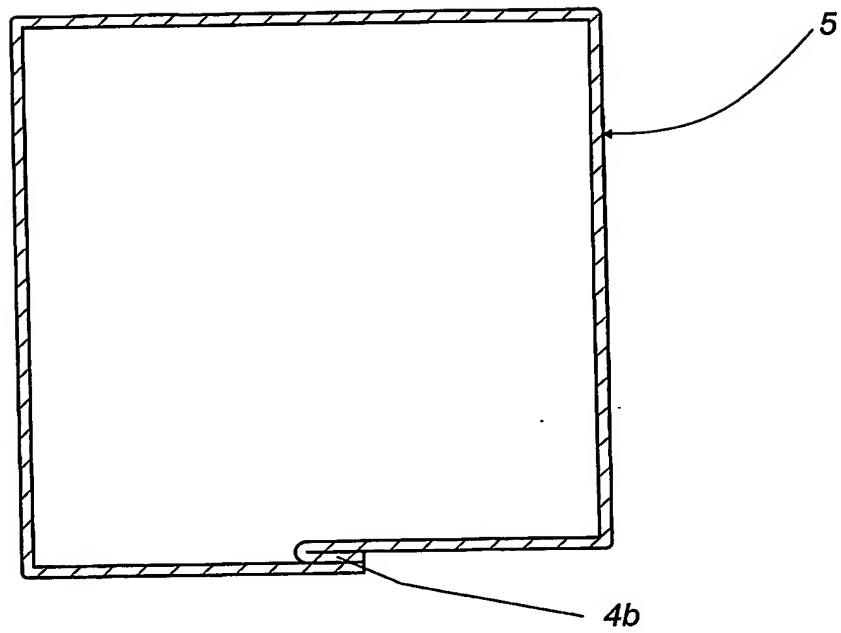
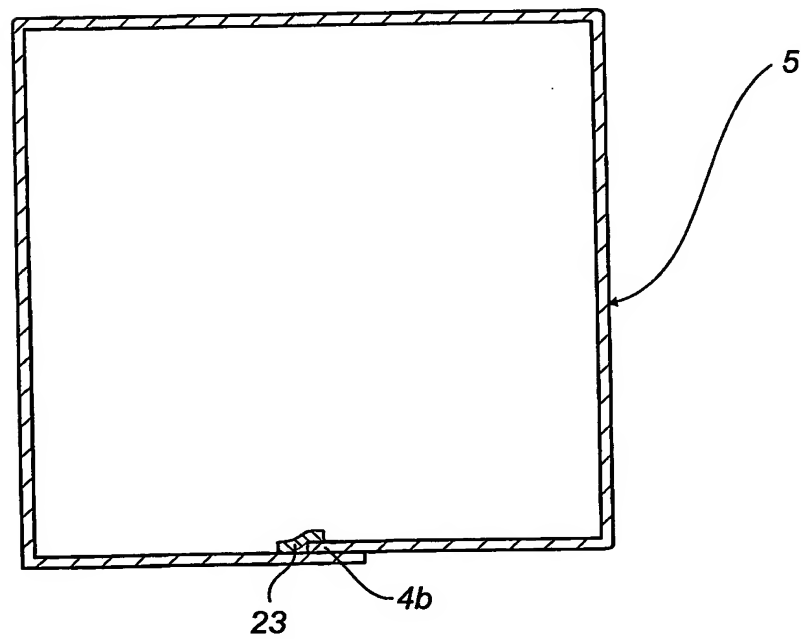


FIG.6



(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
5 February 2004 (05.02.2004)

PCT

(10) International Publication Number  
**WO 2004/011237 A3**

(51) International Patent Classification<sup>7</sup>: **B31B 1/16, 3/00**

(74) Agent: **BIANCIARDI, Ezio**; Bugnion S.p.A., Via Goito, 18, I-40126 Bologna (IT).

(21) International Application Number:  
PCT/IB2003/003205

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(22) International Filing Date: 14 July 2003 (14.07.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
BO2002A 000484 25 July 2002 (25.07.2002) IT

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (*for all designated States except US*):  
**AZIONARIA COSTRUZIONI MACCHINE** [IT/IT];  
AUTOMATICHE A.C.M.A. S.p.A., Via Cristoforo Colombo, 1, I-40131 Bologna (IT).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **BOLDRINI, Fulvio** [IT/IT]; Via Zerbini, 11, I-44100 Ferrara (IT). **GHIOTTI, Roberto** [IT/IT]; Via Togliatti, 4, I-40050 Calderino di Monte San Pietro (IT). **CAVALLARI, Stefano** [IT/IT]; Via del Meloncello, 5, I-40135 Bologna (IT).

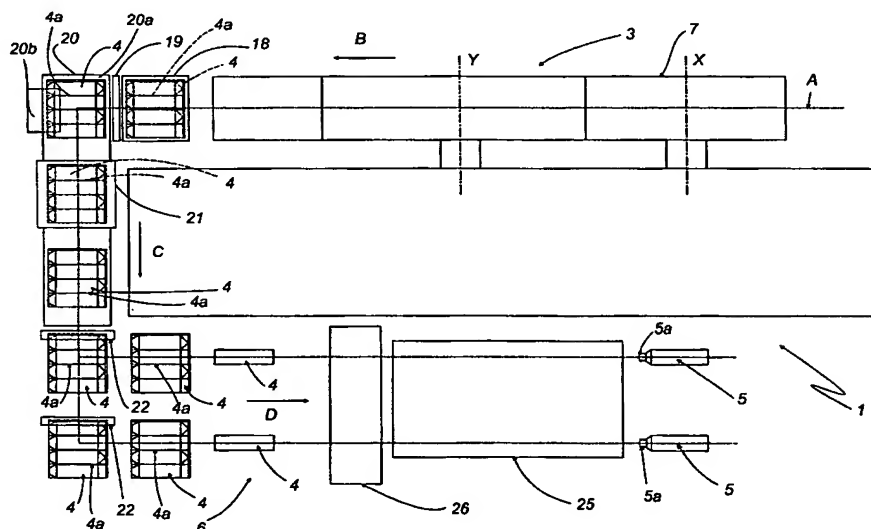
Published:

— with international search report

(88) Date of publication of the international search report:  
21 May 2004

[Continued on next page]

(54) Title: A SYSTEM AND A METHOD FOR MANUFACTURING CONTAINERS, IN PARTICULAR FOR PRESERVING FOOD PRODUCTS



(57) Abstract: A system (1) for manufacturing containers (5) is designed around a supporting structure (2) with which all the stations (7, 18, 19, 21, 24, 25) and the devices (14, 15, 16, 17, 20, 22, 26) needed to produce the containers are associated. The system (1) is equipped with a feed station (7) supplying a forming material (9), a scoring station (18) by which crease lines (4a) are generated, and a cutting station (19), combining to prepare a succession of blanks (4). The system (1) also includes a prefolding station (21) where each blank (4) is bent initially along the creases lines (4a), a folding station (24) where the single blank (4) is fashioned to the shape of the container (5), and a sealing or welding station (26) at which the shape of the container (5) is fixed definitively.



---

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*



# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IB 03/03205

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 B31B1/16 B31B3/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B31B B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 069 021 A (LIEBRAM UDO ET AL) 3 December 1991 (1991-12-03) column 7, line 13 -column 9, line 11; figures 1-3 column 11, line 58 -column 12, line 18 ---	1-39
A	CH 413 339 A (CONTINENTAL CAN CO) 15 May 1966 (1966-05-15) page 3, left-hand column, line 30 - line 35; figures 12-14 ---	5
A	US 5 704 541 A (MOGARD JENS) 6 January 1998 (1998-01-06) column 3, line 14 - line 28; figures 2,3 column 5, line 54 -column 6, line 5; figures 8,10,11 --- -/--	22,24, 28,35

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

3 February 2004

Date of mailing of the international search report

12.02.2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Johne, O

# INTERNATIONAL SEARCH REPORT

Internl Application No  
PCT/IB 03/03205

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 068 761 A (SRAMEK ELMER D ET AL) 18 December 1962 (1962-12-18) column 4, line 59 - line 68; figures 13-15 ---	6,21,31
A	EP 0 900 646 A (GD SPA) 10 March 1999 (1999-03-10) column 5, line 7 - line 24; figures 1,2 ---	6,21,31
A	US 2 748 833 A (MONROE CHARLES Z ET AL) 5 June 1956 (1956-06-05) column 2, line 11 - line 22; figures 1-4 ---	8,12,13
A	GB 957 487 A (ERIK JOHANSEN;PETER SKJODE KNUDSEN) 6 May 1964 (1964-05-06) column 4, line 6 - line 10 column 4, line 24 - line 29; figures 1,3,4 ---	20,26,27
A	US 5 262 126 A (SHIMAMURA ETSUO ET AL) 16 November 1993 (1993-11-16) column 1, line 23 - line 34; figures 10,11 column 8, line 62 -column 9, line 55 ---	14,15,38
A	DE 196 26 705 A (BOSCH GMBH ROBERT) 8 January 1998 (1998-01-08) column 2, line 11 - line 36; figure 1 ---	14,15,38
A	US 3 304 193 A (FRANZ DOLLHEIMER) 14 February 1967 (1967-02-14) column 4, line 23 - line 30; figures 2,4,5 -----	22,25, 34,36

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IB 03/03205

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-5,16-19,22-25,29,30,37,39

feed path circumstribes the supporting structure

2. Claims: 6-13,21,31-36

preforming of the forming material

3. Claim : 20

transfer device with gripper

4. Claims: 26-28

welding station located downstream of folding station

5. Claims: 14,15,38

sterilizing the forming material

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IB 03/03205

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5069021	A	03-12-1991	DE 3927199 A1 AT 93463 T CA 2020164 A1 DE 59002458 D1 DK 413927 T3 EP 0413927 A1 ES 2044326 T3 JP 3118145 A	21-02-1991 15-09-1993 18-02-1991 30-09-1993 04-10-1993 27-02-1991 01-01-1994 20-05-1991
CH 413339	A	15-05-1966	NONE	
US 5704541	A	06-01-1998	AU 719745 B2 AU 2443897 A BR 9709743 A CA 2251894 A1 EP 0907576 A1 JP 2000508994 T NO 984902 A WO 9739958 A1 US 5867966 A US 5943840 A US 5829228 A	18-05-2000 12-11-1997 10-08-1999 30-10-1997 14-04-1999 18-07-2000 23-12-1998 30-10-1997 09-02-1999 31-08-1999 03-11-1998
US 3068761	A	18-12-1962	NONE	
EP 0900646	A	10-03-1999	IT 1294187 B1 EP 0900646 A1	22-03-1999 10-03-1999
US 2748833	A	05-06-1956	US 2682208 A US 2798582 A	29-06-1954 09-07-1957
GB 957487	A	06-05-1964	CH 392374 A	15-05-1965
US 5262126	A	16-11-1993	JP 2057530 A JP 2623767 B2 JP 2098526 A CA 1319808 C DE 68904239 D1 DE 68904239 T2 EP 0342485 A1 US 5122340 A	27-02-1990 25-06-1997 10-04-1990 06-07-1993 18-02-1993 06-05-1993 23-11-1989 16-06-1992
DE 19626705	A	08-01-1998	DE 19626705 A1 WO 9801343 A1 DE 59701596 D1 EP 0912399 A1 ES 2147008 T3 JP 2000513682 T	08-01-1998 15-01-1998 08-06-2000 06-05-1999 16-08-2000 17-10-2000
US 3304193	A	14-02-1967	NONE	